

A photograph of a river with many large rocks and a dense forest in the background. The river is filled with large, light-colored rocks of various sizes, some of which are partially submerged. The water is a murky, greyish-brown color. In the background, there is a dense forest of green trees under a grey, overcast sky. The text "Tidal Freshwater Rappahannock River" and "Total Maximum Daily Load Study" is overlaid on the image in a white, serif font.

# Tidal Freshwater Rappahannock River Total Maximum Daily Load Study

Technical Advisory Committee Meeting  
Fredericksburg, Virginia  
June 5, 2007

# Meeting Agenda

- **Water Quality Assessments and TMDL Process**  
*Katie Conaway, VA Department of Environmental Quality*
- **Bacteria Source Assessment and TMDL Development**  
*Raed El-Farhan, The Louis Berger Group, Inc.*
- **Questions**

# *Why are we here?*

- Learn about water quality in the tidal, freshwater portion of the Rappahannock River.
- Explain efforts that Virginia is undertaking to improve and protect water quality.
- Learn what you can do to help.



# *How do we know if water bodies in Virginia are healthy?*

- Perform physical and chemical monitoring on water bodies throughout the state.
- Monitor parameters such as:
  - pH
  - Temperature
  - Dissolved Oxygen
  - Health of Biological Community
  - Bacteria
  - Nutrients
  - Fish Tissue
  - Metals/Toxic Pollutants



# *What do you do with the monitoring data that is collected?*

Compare the data collected to the water quality standards.

- **Water Quality Standards:**
  - Regulations based on federal and state law.
  - Set numeric and narrative limits on pollutants.
  - Consist of designated use(s) and water quality criteria to protect the designated uses.
- **Designated Uses:**
  - Recreational
  - Aquatic Life
  - Public Water Supply
  - Wildlife
  - Fish Consumption
  - Shellfish



The background is a traditional East Asian ink wash painting. It depicts a misty mountain landscape with several peaks. In the foreground on the right, a willow tree with long, drooping branches is shown. The overall style is minimalist and atmospheric, with a muted color palette of greys, browns, and greens.

**Questions?**

# ***What happens when a water body doesn't meet water quality standards?***

- Waterbody is listed as “impaired” and placed on the 303(d) list.
- Once a water body is listed as impaired, a Total Maximum Daily Load value must be developed for that impaired stream segment to address the designated use impairment.



# *What is a TMDL ?*

## **Total Maximum Daily Load**

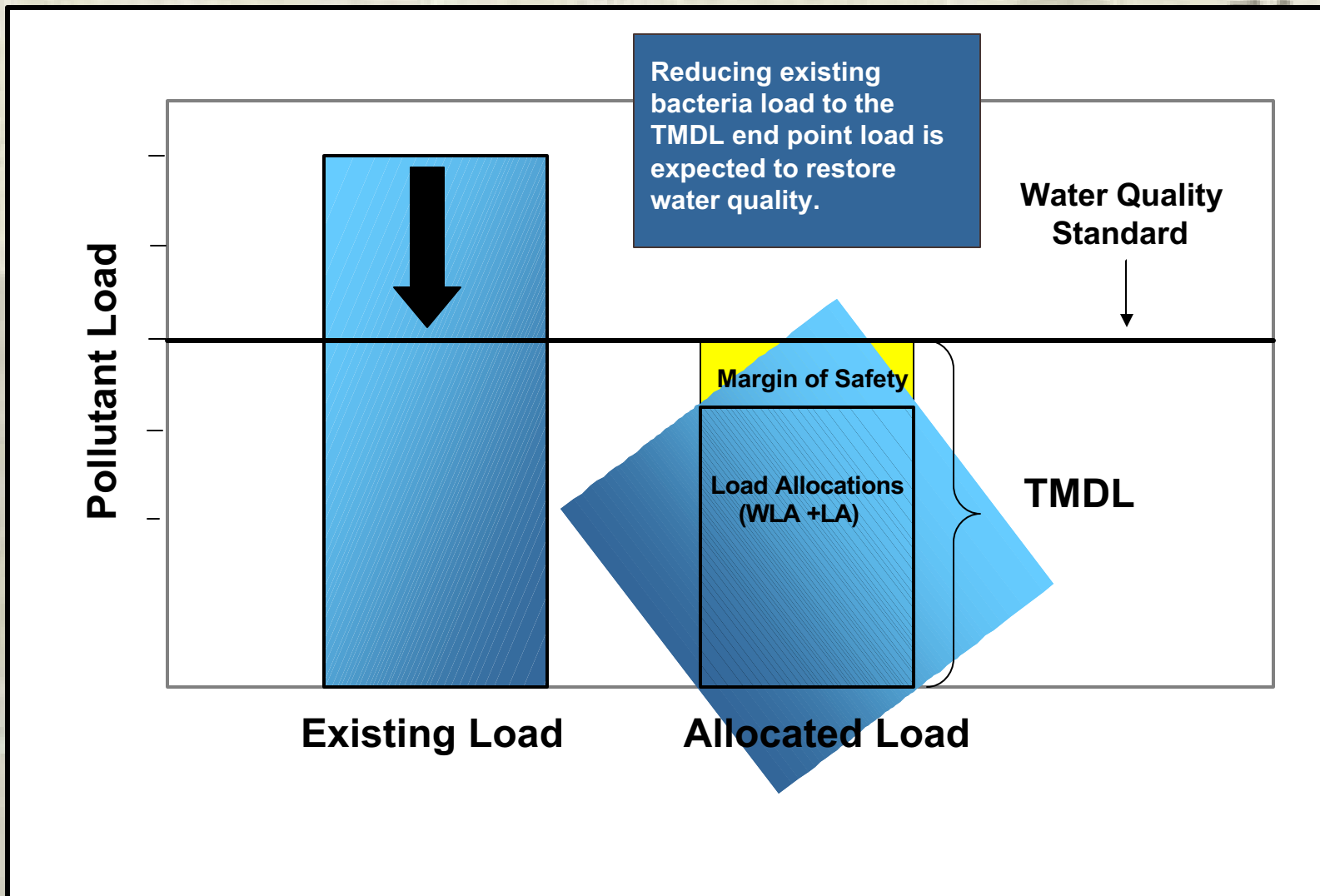
$$\text{TMDL} = \text{Sum of WLA} + \text{Sum of LA} + \text{MOS}$$

Where:

|      |   |                                       |
|------|---|---------------------------------------|
| TMDL | = | Total Maximum Daily Load              |
| WLA  | = | Waste Load Allocation (point sources) |
| LA   | = | Load Allocation (nonpoint sources)    |
| MOS  | = | Margin of Safety                      |



# An Example TMDL



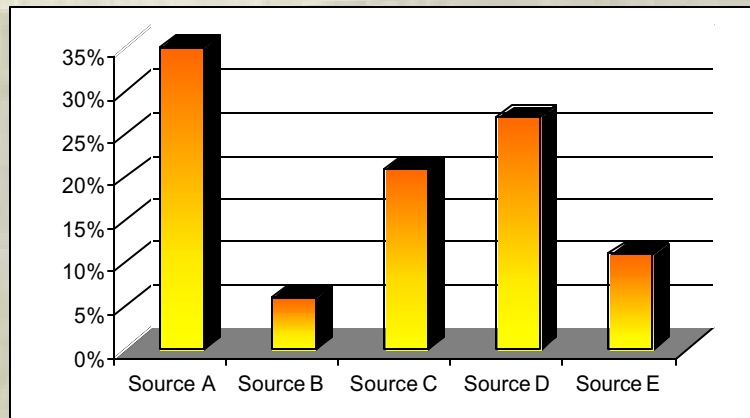
# Required Elements of a TMDL

A TMDL must:

- Be developed to meet Water Quality Standards.
- Be developed for critical stream conditions.
- Consider seasonal variations.
- Consider impacts of background contributions.
- Include wasteload and load allocations (WLA, LA).
- Include a margin of safety (MOS).
- Be subject to public participation.
- Provide reasonable assurance of implementation.

# TMDL Development Methodology

1. Identify all types of sources of a given pollutant within the watershed.



2. Calculate the amount of pollutant entering the stream from each source type.

3. Enter available data into a computer model. Model simulates pollutant loadings into the watershed.

4. Use the model to calculate the pollutant reductions needed, by source, to attain Water Quality Standards.



5. Allocate the allowable loading to each source and include a margin of safety.

# Three Step TMDL Process in Virginia

1. TMDL Development - find the source of the pollutant & determine the reduction needed.

2. Implementation Plan Development - identify conservation measures to fix the problem. Conservation measures are often called Best Management Practices or BMPs.



3. Implement the BMPs and sample to see improvement.

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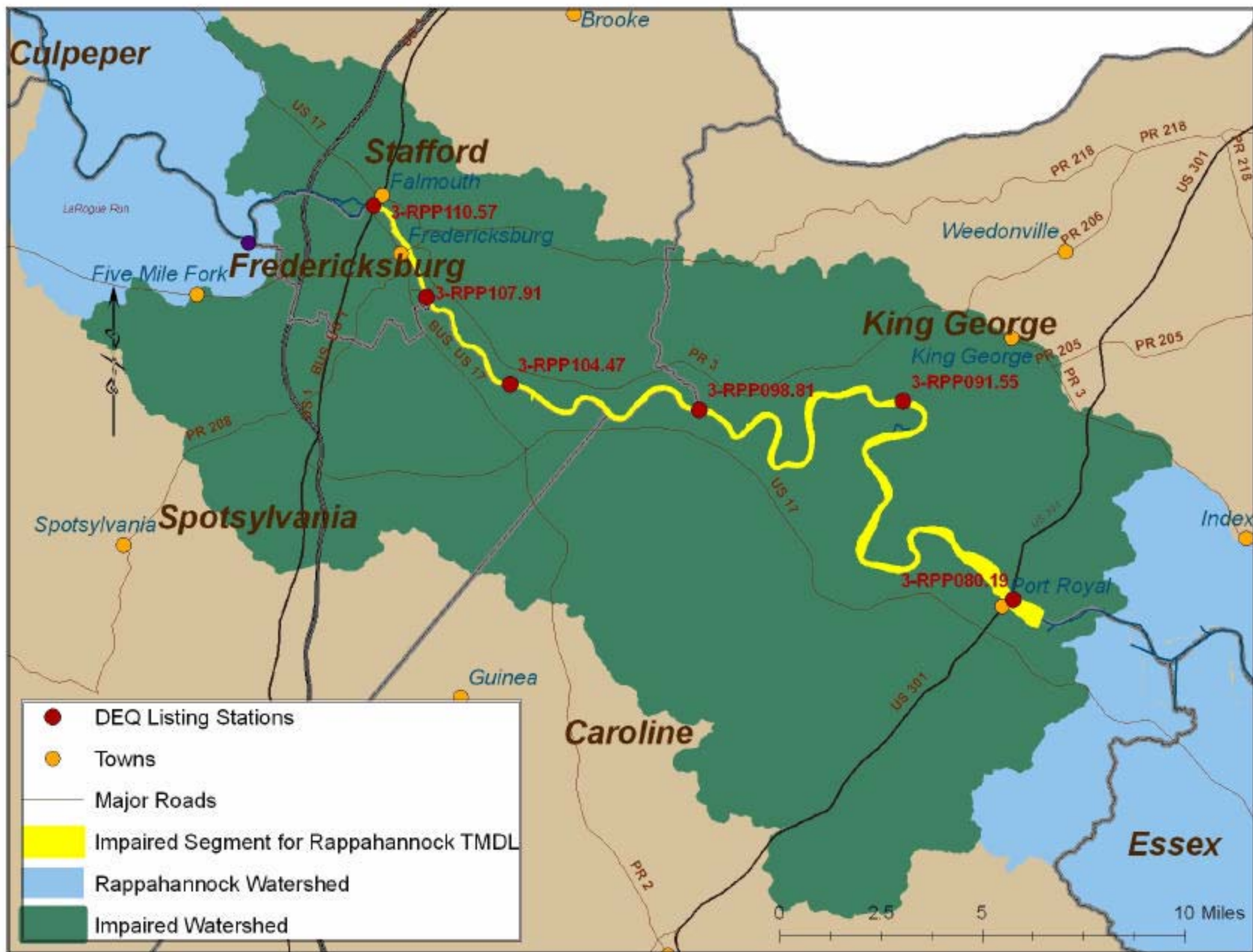
**Questions?**



# *What does this mean for the Rappahannock River?*

- TMDL study is being done for a portion of the Tidal Freshwater Rappahannock River.
- Does not meet the Recreational Use – exceeds the water quality standards for Fecal Coliform and E. Coli Bacteria.

| Stream Name        | Locality  | Impairment                          | Area (mi <sup>2</sup> ) | Upstream Limit                                    | Downstream Limit                                       |
|--------------------|---|-------------------------------------|-------------------------|---|--|
| Rappahannock River | Fredericksburg<br>Caroline<br>King George<br>Spotsylvania<br>Stafford | Fecal Coliform and E. Coli Bacteria | 3.8                     | Fall Line at the Route 1 Bridge in Fredericksburg | Confluence with Mill Creek, below the Route 301 Bridge |



# Exceedance Rates for Rappahannock River

| Monitoring Station | Station Location   | Exceedance Rate Recorded for the 2006 Assessment (01/01/2000 – 12/31/2004) |                         |
|--------------------|--|--|-------------------------|
|                    |  | Fecal Coliform   | E. Coli                 |
| 3-RPP110.57        | Route 1 Bridge   | 6 of 13 samples (46.2%)  | 5 of 11 samples (45.4%) |
| 3-RPP107.91        | One hundred yards below the Fredericksburg Wastewater Treatment Facility | 3 of 16 samples (18.8%)  | N/A                     |
| 3-RPP104.47        | 100 yards below the Massaponax Creek Wastewater Treatment facility       | N/A  | 2 of 7 samples (28.6%)  |
| 3-RPP098.81        | Buoy 112   | N/A  | 2 of 13 samples (15.4%) |
| 3-RPP091.55        | Buoy 89  | N/A  | 3 of 13 samples (23.1%) |
| 3-RPP080.19        | Route 301 Bridge   | N/A  | 2 of 14 samples (14.3%) |

# What are Fecal Coliform Bacteria and *E. Coli* Bacteria?

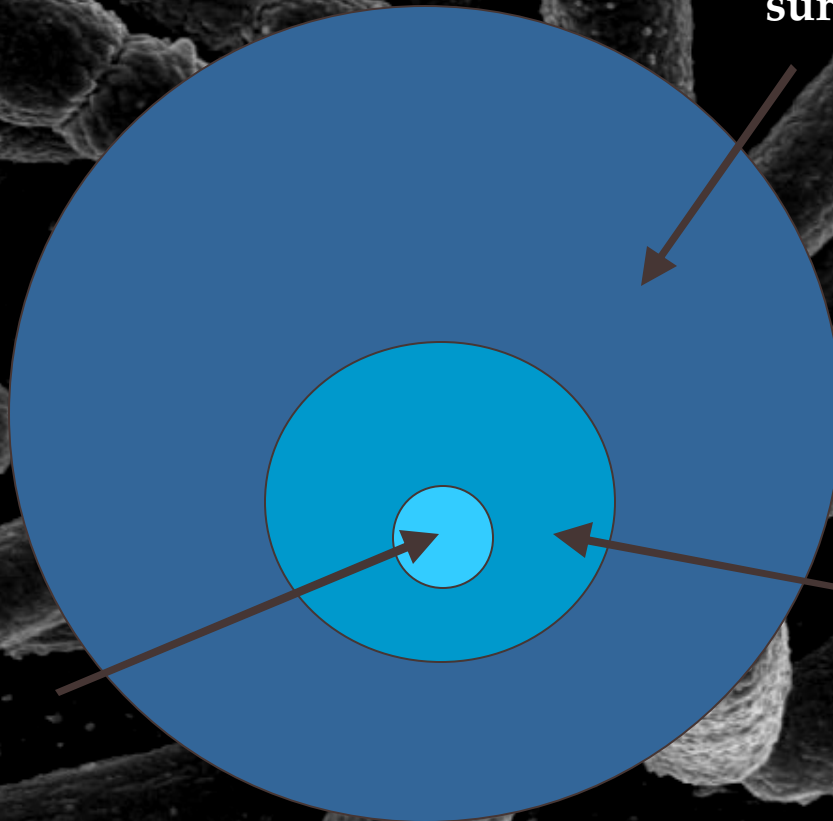
**Coliform Bacteria:**  
Commonly found in soil, decaying vegetation, animal feces, and raw surface water.

***Escherichia coli*:**

- subset of fecal coliform bacteria.
- Correlate better with swimming associated illness.

**Fecal Coliform:**

- Found in the digestive tract of humans and warm blooded animals.
- Indicator of the potential presence of pathogens in water bodies.





# Potential Sources of Fecal Coliform Bacteria



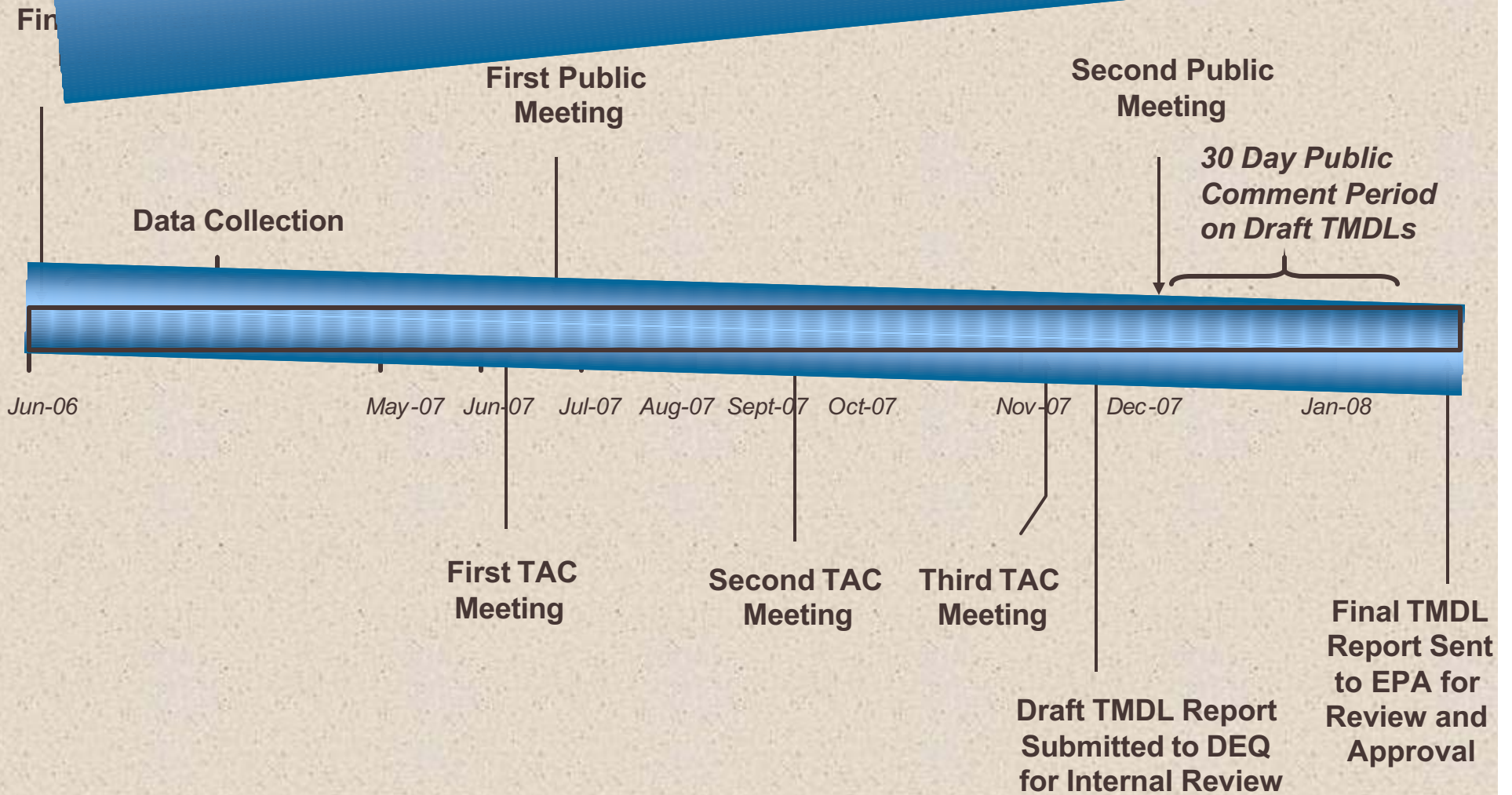


# *What is the Water Quality Standard for Bacteria?*

| Indicator      | Status  | Instantaneous Maximum (cfu/100mL) | Geometric Mean (cfu/100 mL) |
|----------------|---------|-----------------------------------|-----------------------------|
| Fecal Coliform | Old     | 1,000                             | 200                         |
| <i>E. coli</i> | New     | 235                               | 126                         |
| Fecal Coliform | Interim | 400                               | 200                         |

- Changes went into effect on January 15, 2003
- Both New *E. coli* and Interim Fecal Coliform criteria apply
- Fecal coliform criteria will be phased out entirely once 12 *E. coli* samples have been collected or after June 30, 2008
- In order for a water body to be listed as impaired:
  - There must be at least two samples that exceed the water quality criterion.
  - Greater than 10.5% of the total samples must be exceedances.

# Tidal Freshwater Rappahannock Bacteria TMDL Project Milestones



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**Questions?**

# C O N T A C T S

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The background features a textured, light beige paper surface. In the center, there is a faint, stylized illustration of a mountain range with several peaks. On the right side, there is a detailed illustration of a willow tree with long, thin, drooping branches and small, dark, round leaves. The text "Additional Information" is centered over the mountain range.

# *Additional Information*



